AN ANALYSIS OF UNITED STATES NAVY DISASTER RELIEF OPERATIONS

Aruna Apte, Naval Postgraduate School, 555 Dyer Road, Monterey, CA 93943, 831-656-7583, auapte@nps.edu
Keenan D. Yoho, Naval Postgraduate School, 555 Dyer Road, Monterey, CA 93943, 831-656-2029, kdyoho@nps.edu

ABSTRACT

Over the past decade, there have been numerous disasters for which the United States Navy (USN) has provided a significant amount of effective assistance due to its many unique and critical capabilities. During each disaster response the Navy has deployed many different types of ships, however, not all ships are equally suited to contribute effectively to each disaster. Currently, there is no mechanism for explicitly evaluating the utility of vessel types for disaster response.The purpose of this research is to determine which USN assets are best suited for specific disaster relief efforts based upon their capabilities and limitations. A firm understanding of which vessels are most appropriate for use during disaster response will help the USN make more effective decisions when considering the types of vessels it will procure in the future as well as in planning and executing humanitarian operations throughout the world. We discuss the characteristics of specific USN vessels in the context of three events – the 2004 Indian Ocean Tsunami, 2005 U. S. Hurricane Katrina, and 2010 Haiti Earthquake – to illustrate their relative utility for disaster response.

INTRODUCTION

As the world's population settles in the littoral in greater numbers the ability of relief organizations to bring resources from the sea will grow. With its large numbers of general purpose and specialized ships and aircraft the United States Navy (USN) has proven its ability to be an effective partner in humanitarian assistance and disaster response (HA/DR) operations. Although the USN has contributed many ships to past disaster relief efforts not all ships are equally capable of providing effective relief nor should all types of vessels be sent to respond. On November 15, 2007, Cyclone Sidr struck Bangladesh which caused more than10,000 deaths and over US$450 million in damages. In response, the USN decided to send one of its Guided Missile Destroyers (DDG), which was in the vicinity and on which one of the authors of this study, served. Because the the coast of Bangladesh is relatively shallow, the DDG could approach no closer than 25 miles which was out of visible range from shore. Additionally, the DDG was not outfitted with a helicopter, could not produce enough water to supply victims or hospitals ashore, and did not have extra food or medical supplies to provide the disaster victims. In short, the ship was not equipped to provide tangible relief to the devastated area.

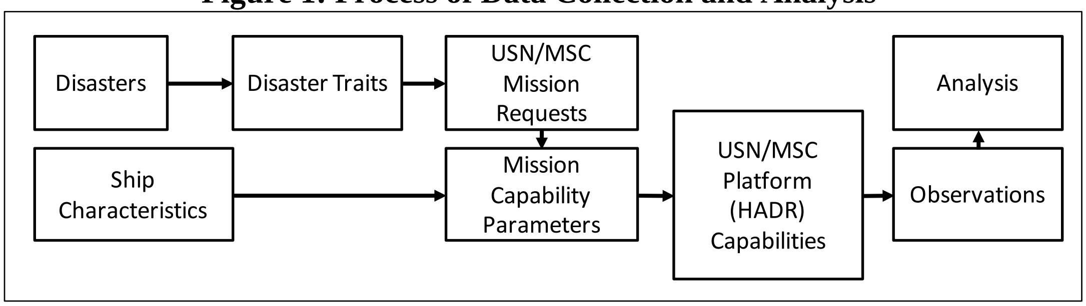
The Bangladesh disaster response case illustrates that in order to become more effective in HADR operations, the USN needs to understand which assets contribute the greatest benefit when responding to specific disasters. The prevailing assumption is that the closest asset is best asset to deploy will not necessarily lead to a suitable or effective utilization of resources. The purpose of this research is to determine which USN assets are best suited for specific disaster relief efforts based upon their capabilities and limitations. A firm understanding of which vessels are most appropriate for use during disaster response will help the USN make more effective decisions when considering the types of vessels to deploy to disaster events as well as assist in determining which vessels it should procure in the future.

This research fills a current void in the literature in that it will analyze the entire inventory of USN and Military Sealift Command (MSC) vessels and evaluate their utility for disaster relief operations. This research should stimulate further work to develop improved scales for evaluating the utility of assets to be used in HADR.

METHODOLOGY

We identify three historical disasters that will be used as cases to evaluate past USN and MSC responses. We then compile and analyze data from multiple USN and MSC publications, historical records, and the response to three disasters to develop an ordinal scale to rate vessels in both the USN and MSC inventories in terms of their relative ability to conduct HADR missions. The data will be divided into three categories: 1) disaster characteristics, 2) timelines of actual USN responses to the specified disasters, and 3) the USN and MSC platform capabilities to conduct HADR missions. Figure 1 shows the overall process of our data collection and analysis. We have collected data for the 2004 tsunami in the Indian Ocean, the 2005 Hurricane Katrina, and the 2010 earthquake in Haiti. These disasters were selected based upon the diversity of their speed of onset and geographic dispersion (see [1] for a further discussion of disaster classifications).

Figure 1: Process of Data Collection and Analysis



DISASTER CHARACTERISTICS

Each of the three disaster cases – the 2004 Indian Ocean tsunami, the 2005 Hurricane Katrina, and the 2010 earthquake in Haiti – resulted in different specific outcomes (see Table 1). However, there are some basic characteristics of these and many other disasters that are similar. Each disaster resulted in a high number of deaths and injuries. The geographical scope of the Indian Ocean tsunami, the failure of levees as well as public administration in Katrina, and sheer devastation in Haiti led to population dispersion causing homelessness and a high number of missing persons. Each disaster resulted in the destruction of infrastructure and facilities that provide common goods such as electricity, telecommunications, roads, warehouses, airports, and ports. Additionally, food, water and medical supplies were all in high demand as well as a need for the removal of large volumes of debris. Since each disaster occurred near the coast there was also some uncertainty with respect to navigation of coastal waters (there were floating oil rigs as a result of Hurricane Katrina, collapsed container cranes and docks in Haiti). We have summarized what we identify as common disaster traits in Table 2.

Table 1: Effects of Indian Ocean Tsunami, Hurricane Katrina and Haiti Earthquake

(Sources: [6] [10] [2] [4] [7] [9] [16])

	2004 Indian Ocean Tsunami	2005 Hurricane Katrina	2010 Haiti Earthquake
Deaths	>227,000	>1,700	92,000-220,000 estimated
Injured	>500,000	>2,000 in New Orleans alone	250,000
Missing	>2,000,000 (summary of initial reports)	>12,000 reported	20,000
Displaced	>1,500,000	>1,000,000 in gulf coast states	1,100,000
	In Indonesia, more than 25% of Aceh Province's villages were destroyed	>3 million people without power; broken water mains left thousands without fresh water	Destruction of all five medical facilities around Port-au-Prince
	Land transportation infrastructure suffered significant damage on many islands throughout the Indian Ocean	Flooding and closure of Louis Armstrong New Orleans International Airport	Destruction of Toussaint L'Ouverture International Airport
	Indonesia's Aceh Province lost most elements of local communications infrastructure	>80% of New Orleans underwater on August 31, 2005	Considerable damage to communication infrastructure
	Many islands lost all electric-power production capability	Major flooding and closure of many gulf coast highways	Major damage to roadways by debris
	The U.S. pledged more than one third of a billion dollars to repair and replace roads and fresh water distribution systems	Considerable damage to the oil and fishing industries	Major damages to the Port-au-Prince seaport, rendering it unusable for immediate rescue operations

Table 2: Basic Disaster Traits

High number of deaths and injuries
Population dispersion, homelessness, and high number of missing persons
Facility destruction and loss of common goods such as fresh water supply
Increased demand for critical commodities such as fresh water, food, and medical supplies
Need for medical personnel, facilities, and volunteers
Destruction of transportation infrastructures such as airports, seaports, railroads, and roads
High amounts of debris and destroyed buildings
Uncertainty in coastline with regards to navigation (coastal specific)

USN AND MSC DISASTER RESPONSE CAPABILITIES

The measure of a ship's capability to conduct a specific HADR mission set is derived from the vessel's specific characteristics. The specific characteristics of all USN and MSC vessels is drawn from public databases such as Jane's Fighting Ships [3], the MSC Handbook [5], and the online Navy Fact Files [8]. Common vessel characteristics of interest are speed, draft, lift capacity, number of onboard personnel, fresh water making capacity, storage space, and other traits that enable a ship to support identified a humanitarian assistance and disaster response mission.

The USN and MSC have many different types of vessels with multiple mission capabilities. In order to understand which ships are better suited for HADR operations it is essential to study the different types of missions that operational commanders may be requested to conduct. Search and rescue (SAR) operations are most effective when a vessel has an embarked helicopter. Large numbers of homeless persons may be assisted by conducting personnel transfers from unstable to stable locations with a vessel designed to hold large number of personnel and has a shallow draft. Trauma needs may be best met by trauma team and facilities such as operating rooms aboard a hospital ship or amphibious assault vessel. These are examples of the different mission capabilities the USN and MSC possess to address specific disaster traits listed in Table 2.

Mission capabilities may be described in terms of critical and non-critical. Non-critical mission capabilities are those that may be demanded in non-disaster situations whereas critical mission capabilities are those that are often specific to HADR operations. Critical mission capabilities typically have a high impact on relief efforts, while non-critical mission capabilities may not have a major impact on affected personnel or land-based facilities. Critical and non-critical capabilities are described in Table 3.

Table 3: Critical and Non-critical HADR Mission Requests

Critical Mission Capabilities		Non-Critical Mission Capabilities
Aircraft support capability		Transit speed
Amphibious Landing Craft support		Hydrographic survey
Search and Rescue (SAR)		Salvage operations
Cargo Capacity	Dry goods storage	Towing capability
	Refrigerated goods storage	
	Fresh water storage	
	Roll On Roll Off (RORO)	
	Fuel storage & dispensation	
	Self-sufficient; no need for external cranes	
Personnel transfer		
Fresh water production		
Personnel support for cleanup and recovery efforts		
Berthing capacity		
Medical support		

PLANNED ANALYSIS AND ANTICIPATED RESULTS

In our analysis we will compare characteristics of USN and MSC platforms to basic mission capabilities (in Table 3) to identify which USN and MSC vessels are best suited to conduct HADR operations. We will evaluate the relative utility of each vessel type using ordinally scaled expert ratings which are assigned by USN surface warfare officers. The ordinal ratings have three values indicating whether a ship has “little to no capability,” “some capability” or “significant capability” to accomplish a specific mission set. We will divide the USN vessels in four categories: 1) nuclear powered aircraft carriers (Nimitz and Enterprise class), 2) amphibious ships, 3) cruisers and destroyers (CRUDES), and 4) other which include the littoral combat ships (LCS), patrol craft (PC), and mine countermeasures (MCM) ships. The MSC vessels will be divided into five categories which correspond to the different commands within the organization: 1) PM-1 vessels that are part of the Naval Fleet Auxiliary Force, 2) PM-2 which are special mission ships, 3) PM-3 prepositioning ships, 4) PM-5 sealift ships, and 5) Ready Reserve Force vessels. In order to understand how U.S Navy HADR capabilities have been deployed in the past, as well as the types and levels of capability provided, we will collect data about ‘on-scene’ arrival of every ship that was deployed to respond to the 2004 Indian Ocean tsunami, the 2005 Hurricane Katrina, and the 2010 Haiti Earthquake. By combining days that a ship was present during the disaster with the ratings of the ship’s mission capabilities, we will be able to determine a composite capability that is an indicator of the mass of disaster response support that the USN and MSC contribute to each HA/DR mission.

Our analysis will provide both military and non-military leaders with a better understanding of the types of capabilities the USN and MSC may bring to bear on a disaster event and which types of assets have the most utility. Further, our results will help inform USN and MSC decision makers as to which vessels have the greatest utility to support HA/DR operations which continue to play a larger role in naval activities.

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